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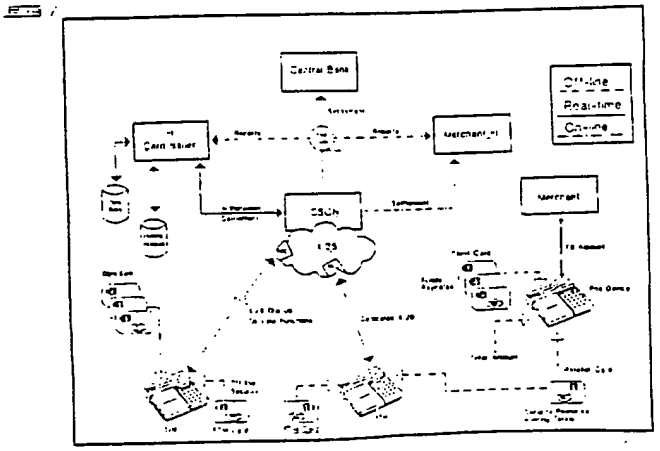
(54) Funds transfer system.

(57) The present invention relates to a method of transferring funds characterized in that it includes the steps of linking a first portable data storage and processing device to a first financial institution; debiting an account held at the financial institution and recording a corresponding credit value in the first portable data storage and processing device; linking the first portable data storage device to a second, similar device; reducing the credit value in the first device and recording a corresponding credit value in the second device; linking the second portable data storage and processing device to a second financial institution; reducing the credit value in the second device; and recording a corresponding credit value in an account held at the second financial institution.



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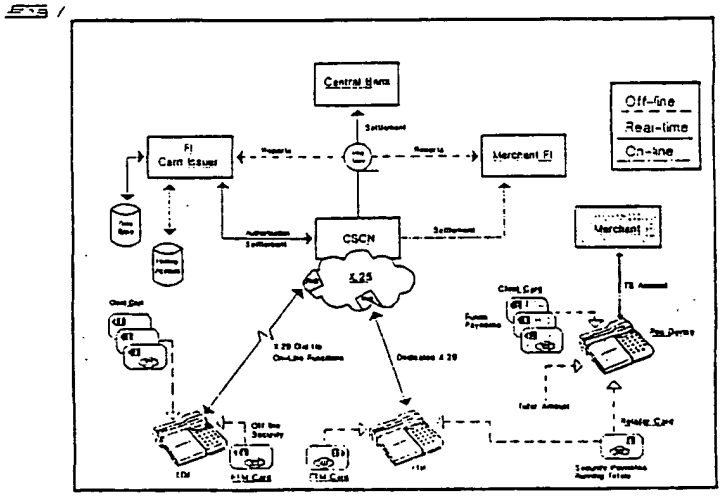

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The third terminal means is preferably a card reader device adapted to receive both smart cards and to allow data transfer therebetween.

Preferably, the card reader device operates under the control of a stored program which facilitates the interaction of the first and second smart cards.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic illustration of a funds transfer system according to the invention;

Figure 2 is a schematic illustration of a basic mode of operation of the system of Figure 1;

Figure 3 is a basic schematic block diagram of a card reader device used in the system of Figure 1; and

Figures 4 to 7 illustrate schematically several different operations possible with the system of Figure 1.

DESCRIPTION OF AN EMBODIMENT

The funds transfer system illustrated schematically in the drawings is designed to allow the direct transfer of funds from a first financial institution to a cardholder, from the cardholder to a retailer, and from the retailer to a second financial institution, via an analogue or digital data network. In order to allow the necessary data to be transferred in a convenient manner, use is made of "smart cards". Such devices are well known and comprise a credit card-like substrate on which is mounted an integrated circuit containing a central processing unit (CPU) and associated random access memory (RAM) and read-only memory (ROM), as well as an electrically erasable programmable read-only memory (EEPROM).

Contacts on the surface of the substrate allow a suitable card reader device to apply power to the computer on the card and permit data transfer to and from the computer.

The operation of the system is illustrated in a highly simplified form in the diagram of Figure 2. In the first leg of the process, a card holder obtains funds from an account held at a financial institution (FI). This is carried out in real time or on-line via a funds transfer machine (FTM) which is linked to the financial institution via the data network. The cardholder selects an amount to be credited to his personalised smart card (referred to hereinafter as a client card), and a credit balance on his client card is increased, while the balance in his account at the financial institution is debited correspondingly.

The cardholder can now use his client card to conduct financial transactions of different kinds, in either an on-line or an off-line manner. Typically, as shown in Figure 2, the client card will be used by the cardholder in a transaction in which goods are purchased from a retailer. The retailer is provided with a point of sale (POS) device which is a self-contained, battery powered smart card reading device. To conduct a transaction, both the client card and a personalised smart card of the retailer (hereinafter called a retailer card) are both inserted into the POS device, which operates under the control of a stored program to allow communication between the client card and the retailer card. The amount of the transaction is entered into the POS device. This amount is then presented to the client card, which reduces the credit value stored in its EEPROM by the amount of the transaction, and forwards this amount to the retailer card which increases a credit value stored therein by the same amount.

Once the transaction is completed, the client card of the cardholder is removed from the POS device while the retailer card remains in the device. The retailer will typically conduct a number of different transactions with different cardholders during the course of a business day, and an accumulating total credit value will be stored in the retailer card. At intervals, typically at the end of each working day, the retailer will remove the retailer card from the POS device and insert it into a dedicated funds transfer machine (FTM) which is linked to a second financial institution (that is, the financial institution at which the retailer holds an account) via the electronic data network.

The transaction information stored on the retailer card is transferred to the retailer's financial institution, which identifies the accounts of the various cardholders who have conducted transactions with the retailer, and which then credits the retailer's account with the total value of the transactions, and debits the financial institution's cardholder account with the value of the respective transaction. A magnetic tape record of the data transmissions conducted over the data network allows the respective financial institutions to generate printed statements for the cardholders and the retailer, if necessary. The cardholder can also use his card in an on-line manner, via an on-line funds transfer machine, to settle accounts, credit his card with a salary payment or another deposited amount, or conduct similar on-line transactions.

The advantage of an electronic funds transfer system of the kind described above in broad terms is that both conventional currency, such as cash or cheques, and conventional credit transactions, such as those employing credit cards, can be replaced. Delays in processing financial transactions are reduced or eliminated, while the use of cards on which a credit balance is stored ensures the avail-

sage to the FTM containing the TSN, the USN, and a code indicating whether the transaction was good or bad. The TSN stored in the card is incremented. The above data is encrypted with the data network key and is transmitted via the network to the financial institution for confirmation of the transaction. The display of the FTM now prompts the cardholder to remove his client card.

The result of the above transaction is that an amount of funds corresponding to the figure entered by the cardholder into the FTM is deducted from the credit balance of his account at the financial institution and transferred to a holding account of the financial institution. The credit balance stored on the client card is updated by the same amount, and can now be used to conduct further transactions. A state table of the above described transaction is shown in Appendix 1.

The above described transaction takes place between the financial institution and a so-called secure card account (SCA) which can only be accessed via a high security encryption/decryption procedure. The client card also makes provision for a high speed self service (HSSS) account which is limited to a relatively low maximum credit balance and which does not require the use of a password to be debited. This account can be used, for example, when using vending machines or the like, where relatively small amounts are involved. A state table showing how funds are transferred from the secure card account (SCA) to the high speed self service (HSSS) account is shown in Appendix 2.

Assuming now that cardholder wishes to conduct a transaction with a retailer, such as the purchase of goods or services, the card reader terminal illustrated in Figure 3 is used, configured as a point of sale (POS) device. When this device is turned on by the retailer, the display prompts the retailer to enter the retailer card into the appropriate slot at the bottom of the machine. The card outputs its identity code to the device, which verifies that it is a retailer card, and a handshaking procedure is carried out as described above with reference to the funds transfer machine.

The retailer card has a merchant information file which stores, inter alia, the merchant's name, a "hot card" file and transaction batch numbers. The main menu of the software stored in the terminal is now displayed, and offers a choice of "Sales" or "Utilities". Assuming that "Sales" is selected, a second menu appears, offering a choice of "Purchase" or "Card balance". The latter option allows the retailer to check the running total credit balance stored in his card.

Assuming that the "Purchase" option is selected, the display will then prompt the retailer to enter the amount of the transaction. This can be done directly via the keypad 22, or via the input/output interface 20, if the card reader terminal is connected to a till. The display now prompts the cardholder to enter his client card into the second card reader, and a handshaking procedure once again takes place to ensure that the correct type of card is being used.

The sequence of events is described in the state table of Appendix 3, and includes the generation of a random key by the client card which is then used in the subsequent messages for this transaction. The retailer card checks to see whether the credit balance stored thereon is below the permissable maximum and that the amount of the transaction will not cause the balance to exceed the maximum. Information from the client card is now read into the RAM 12 of the terminal, including the client identification code and balance information. Once the security measures (up to and including Utility 4 in Appendix 3) have been carried out, the terminal prompts the card holder to indicate whether a secure card account (SCA) transaction or a high speed self service (HSSS) transaction is desired. The terminal now runs a utility to check whether the client card is on the "hot card" list stored on the retailer card, and if so, aborts the transaction, and switches off the client card.

The terminal now prompts the cardholder to enter his password. If the correct password is recognised, a flag is set in the RAM of the card. The amount of the transaction, the date, the retailer identity, and the transaction batch number are now transferred directly to the client card in an unencrypted form. The microprocessor of the client card checks that the flag in the RAM is correctly set to indicate the use of the correct password, and checks the identity of the retailer card to ensure that it is in fact a retailer card. The transaction information is then stored in the RAM of the card. The transaction information is now written to the transaction file on the client card and the balance in the client card is updated (that is, reduced) and stored in a non volatile memory area of the card. If the amount of the transaction is greater than the stored balance (that is, an impermissible transaction) the card is put into a CPU loop so that it "hangs", and cannot be reset except by aborting the transaction. Once the transaction has been encrypted and recorded, the RAM of the card is cleared.

The terminal now transmits the encrypted transaction information to the retailer card, and the cardholder's identification number and the record sequence number are checked, both to ensure a valid transaction and to ensure correct decryption. The accumulated credit balance on the retailer card is now updated. Similarly to the client card, the card will "hang" if the total balance exceeds the

wider than the specific example given above. The described system can be used to operate savings, transmission and current accounts, as well as credit accounts (including general credit accounts and specific credit accounts such as petrol or garage type accounts). The system is also applicable to the running of mortgage bond accounts, subscription deposit accounts, or foreign exchange accounts, for example.

Claims

1. A method of transferring funds characterised in that it includes the steps of linking a first portable data storage and processing device to a first financial institution; debiting an account held at the financial institution and recording a corresponding credit value in the first portable data storage and processing device; linking the first portable data storage device to a second, similar device; reducing the credit value in the first device and recording a corresponding credit value in the second device; linking the second portable data storage and processing device to a second financial institution; reducing the credit value in the second device; and recording a corresponding credit value in an account held at the second financial institution.

2. A method according to claim 1 characterised in that the first and second devices each store at least a portion of a program which is run in a synchronised interactive manner between the first and second devices.

3. A method according to claim 2 characterised in that a terminal means is provided which receives the first and second devices and permits data transfer therebetween, the terminal means operating under the control of a stored program to facilitate interaction of the first and second devices.

4. A method according to any one of claims 1 to 3 characterised in that the first and second financial institutions are one and the same bank, building society or another similar institution.

5. A method according to any one of claims 1 to 3 characterised in that the first and second financial institutions are different banks, building societies or other similar financial institutions.

6. A method according to any one of claims 1 to 5 characterised in that the first and second portable data storage and processing devices are "smart cards" comprising electronic data storage and processing circuitry on a credit card-like substrate, operating under the control of stored software.

7. A method according to any one of claims 1 to 6 characterised in that the first device is allocated to an individual registered at the first financial institution, while the second device is allocated to a retailer or other commercial entity, the magnitude of the reduction in the credit value stored in the first device corresponding to the value of a transaction between the individual and the retailer or commercial entity.

8. A method according to any one of claims 1 to 7 characterised in that the second device totals the credit values recorded therein, so that the credit value recorded at the second financial institution corresponds to the total of all credit values recorded in the second device in a predetermined period.

9. A system for transferring funds characterised in that it includes first and second portable data storage and processing devices; first terminal means for linking the first device to a first financial institution; second terminal means for linking the second device to a second financial institution; and third terminal means adapted to receive the first and second devices and to permit data transfer between them, so that a credit value stored in the first device which corresponds to a debit from an account held at the first financial institution can be reduced by a desired amount and a corresponding credit value can be recorded in the second device, the second device being adapted to transfer the credit value stored therein to an account held at the second financial institution.

10. A system according to claim 9 characterised in that the first and second devices each store at least a portion of a program which is run in a synchronised, interactive manner between the first and second devices.

11. A system according to claim 9 or claim 10 characterised in that the first and second portable data storage and processing devices are "smart cards" comprising electronic data storage and processing circuitry on a credit card-like substrate, operating under the control of stored software.

12. A system according to claim 11 characterised in that the first and second terminal means are adapted to link the respective smart cards to the respective financial institutions via a data network.

13. A system according to claim 11 or claim 12 characterised in that the third terminal means is a card reader device adapted to receive both smart cards and to allow data transfer therebetween.

14. A system according to claim 13 characterised in that the card reader device operates under the control of a stored program which facilitates the interaction of the first and second smart cards.

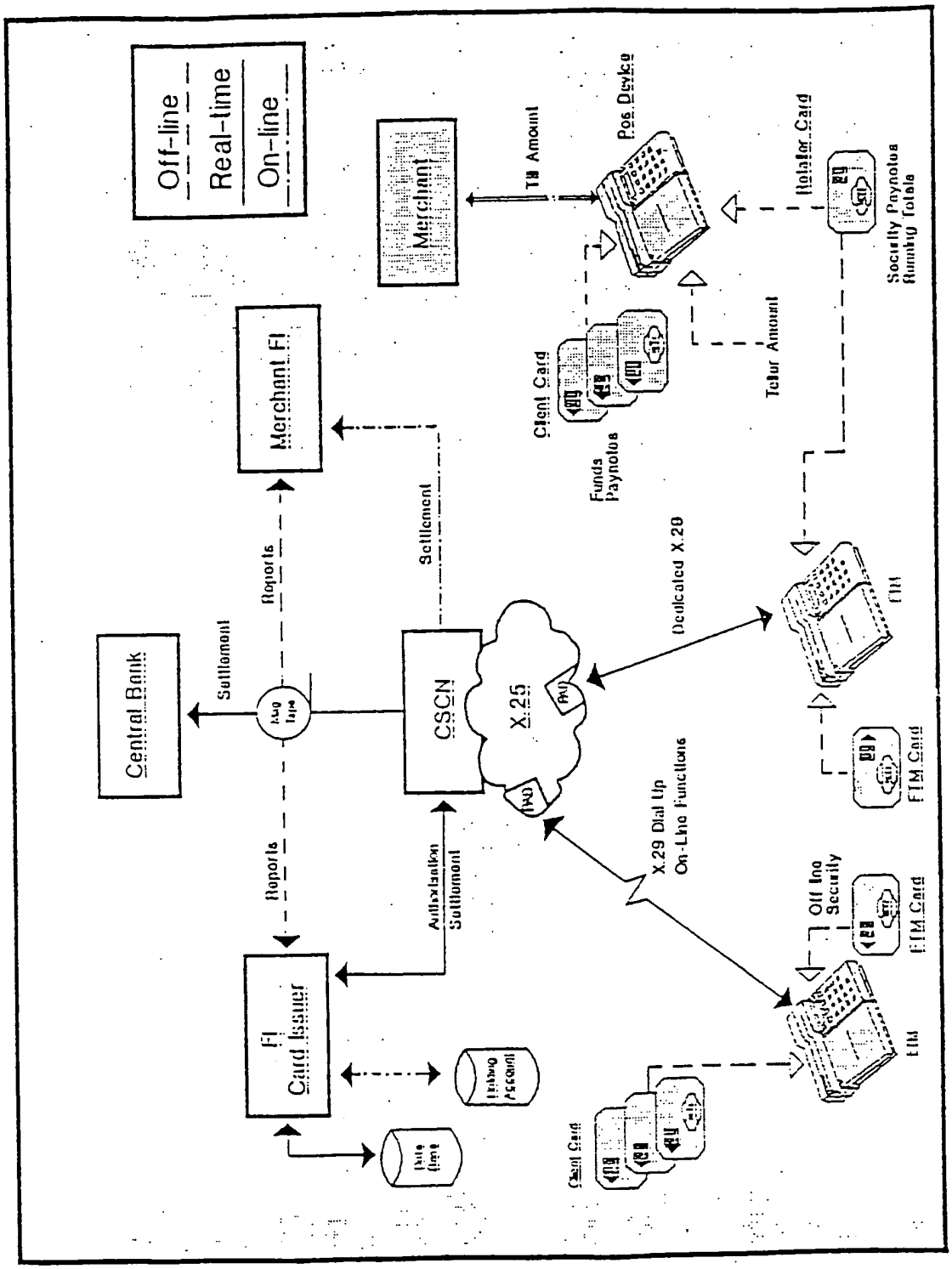

Off-line
Real-time
On-line
Merchant
Merchant FI
Central Bank
Settlement
Reports
Settlement
CSCN
X.25
Reports
Authorization
Settlement
FI
Card Issuer
Client Card
Funds
Payments
Teller Amount
Holder Card
Security Payments
Running Totals
Dedicated X.29
X.29 Dial Up
On-Line Functions
Off line
Security
FIM Card
FIM
FIM Card

FIG 1

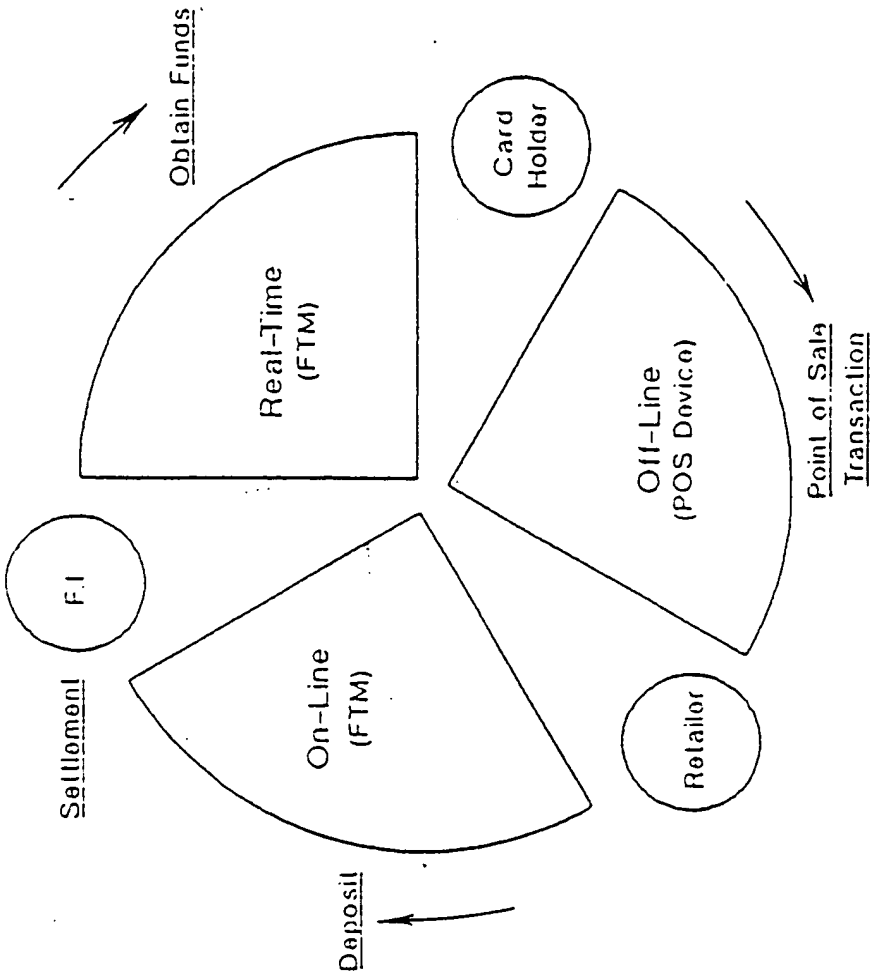
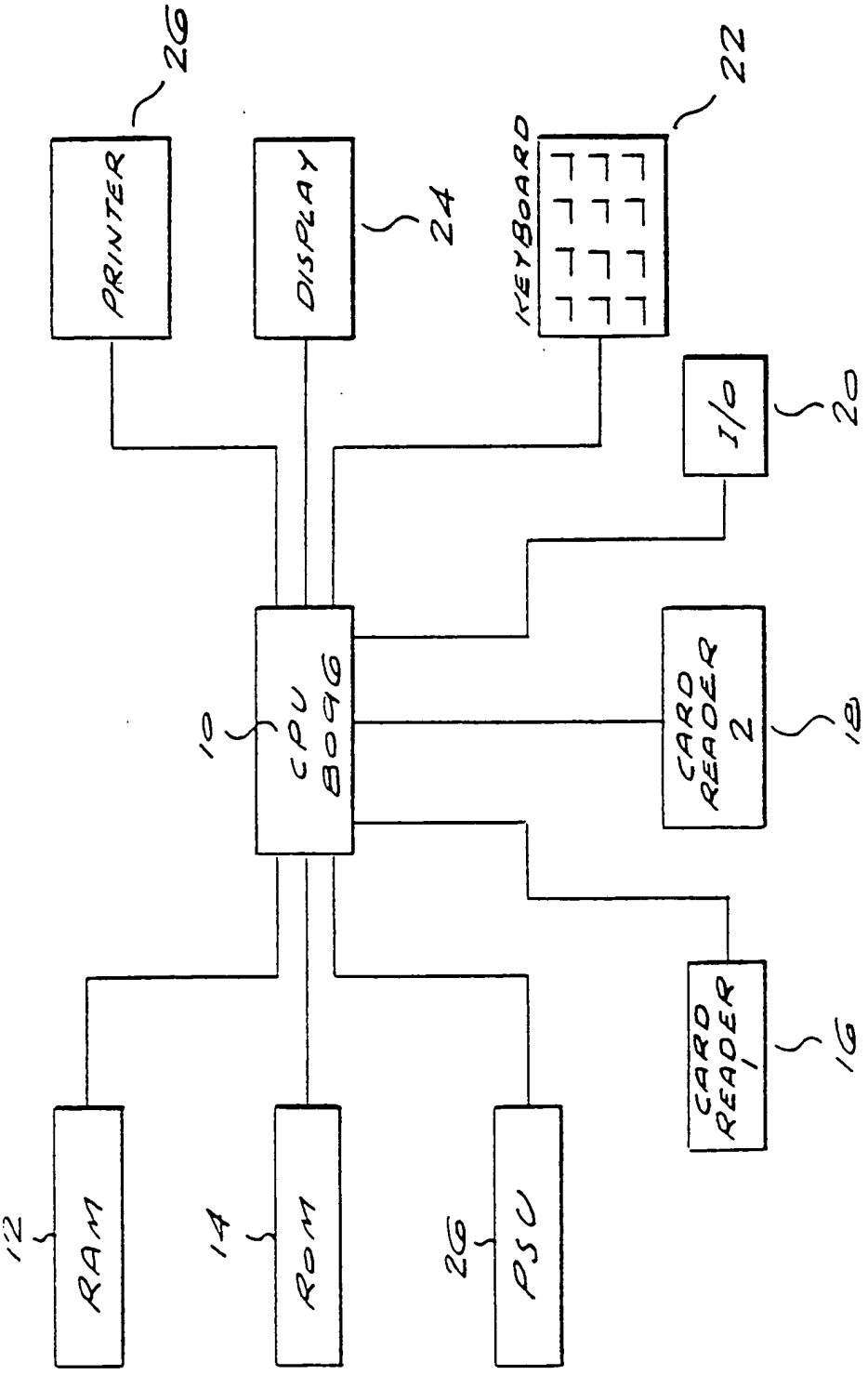

Obtain Funds
Card Holder
Real-Time (FTM)
Off-Line (POS Device)
Point of Sale Transaction
F.I
Settlement
On-Line (FTM)
Retailer
Deposit

FIG 2

FIG 3


PRINTER
26
DISPLAY
24
KEYBOARD
22
I/O
20
CPU
8096
10
CARD
READER
2
18
CARD
READER
1
16
RAM
12
ROM
14
PSU
28

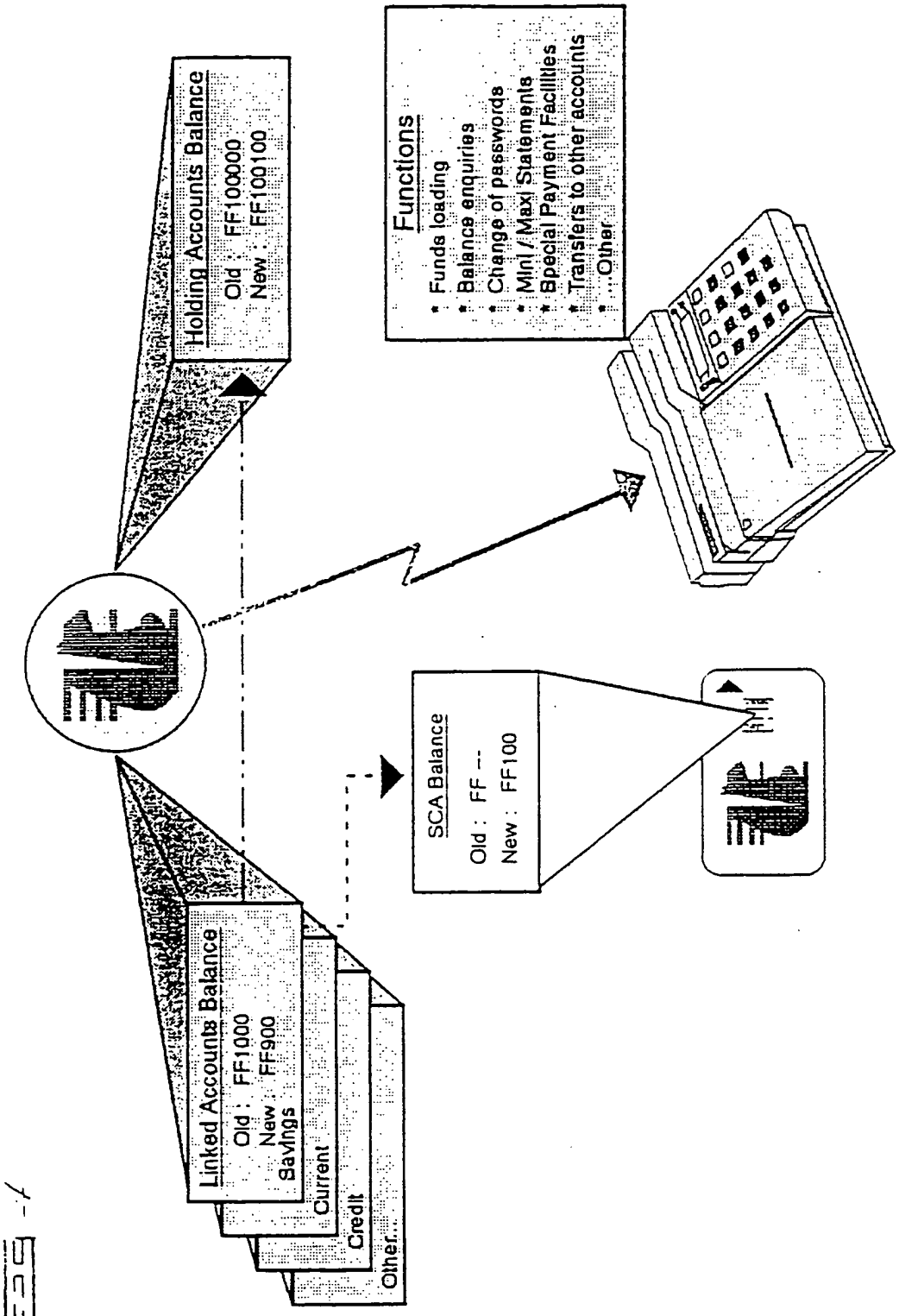

Holding Accounts Balance
Old : FF100000
New : FF100100
Functions
* Funds loading
* Balance enquiries
* Change of passwords
* Mini / Maxi Statements
* Special Payment Facilities
* Transfers to other accounts
* ...Other
SCA Balance
Old : FF ---
New : FF100
Linked Accounts Balance
Old : FF1000
New : FF900
Savings
Current
Credit
Other...

FIG - 1

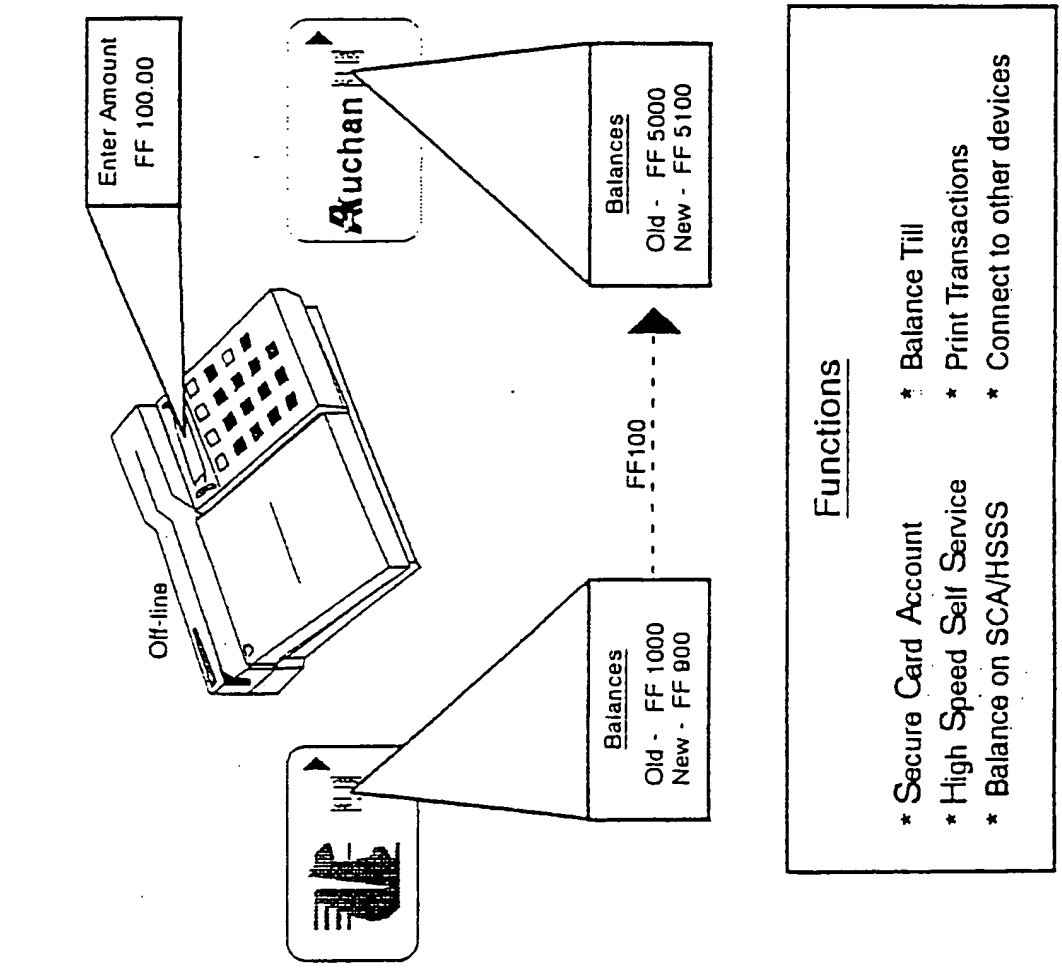

Enter Amount
FF 100.00
Off-line
Auchan
Balances
Old - FF 5000
New - FF 5100
FF100
Balances
Old - FF 1000
New - FF 800
Functions
* Secure Card Account
* High Speed Self Service
* Balance on SCA/HSSS
* Balance Till
* Print Transactions
* Connect to other devices

FIG 5

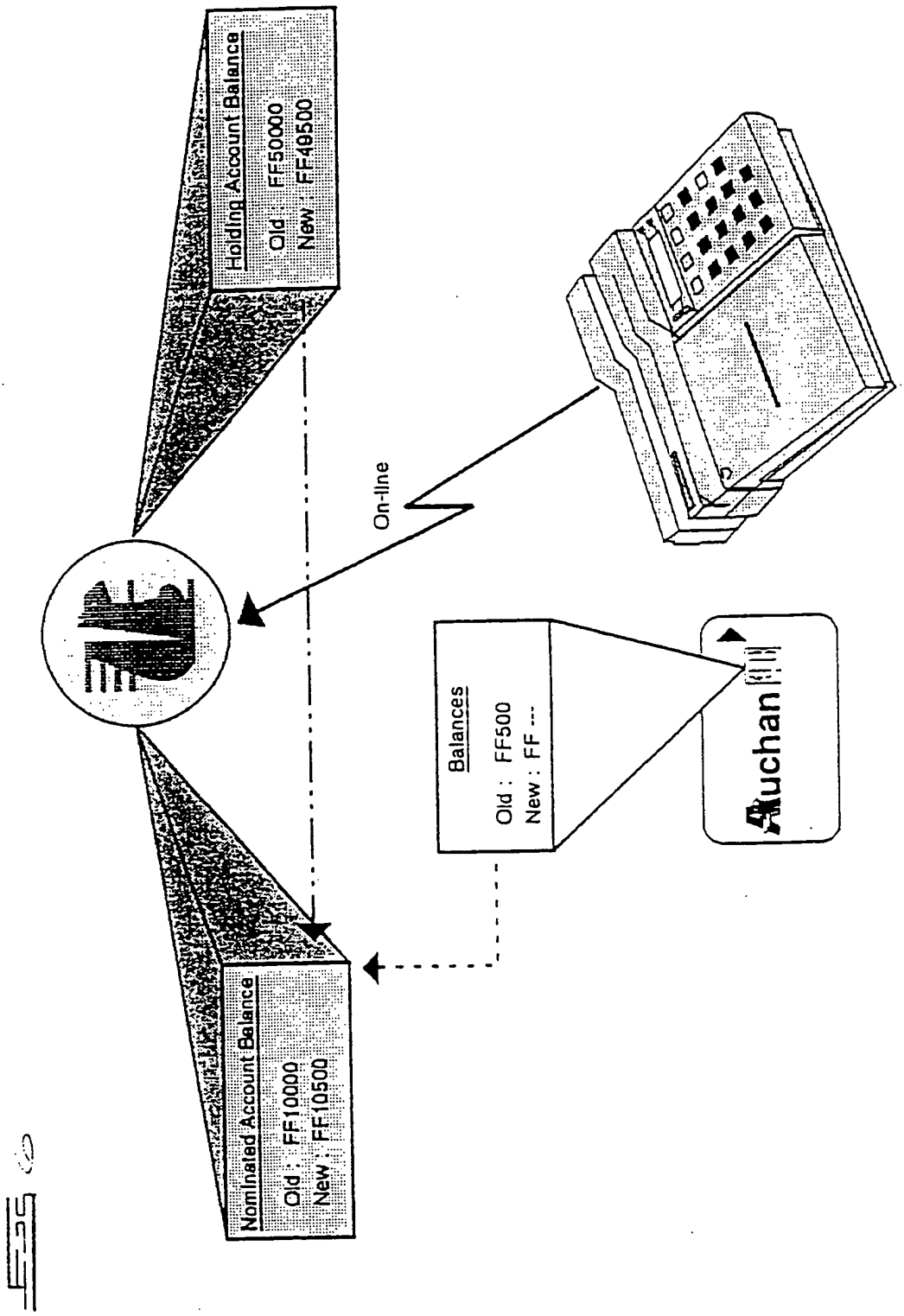

Holding Account Balance
Old : FF50000
New : FF40500
On-line
Balances
Old : FF500
New : FF ---
Auchan
Nominated Account Balance
Old : FF10000
New : FF10500

FIG 3

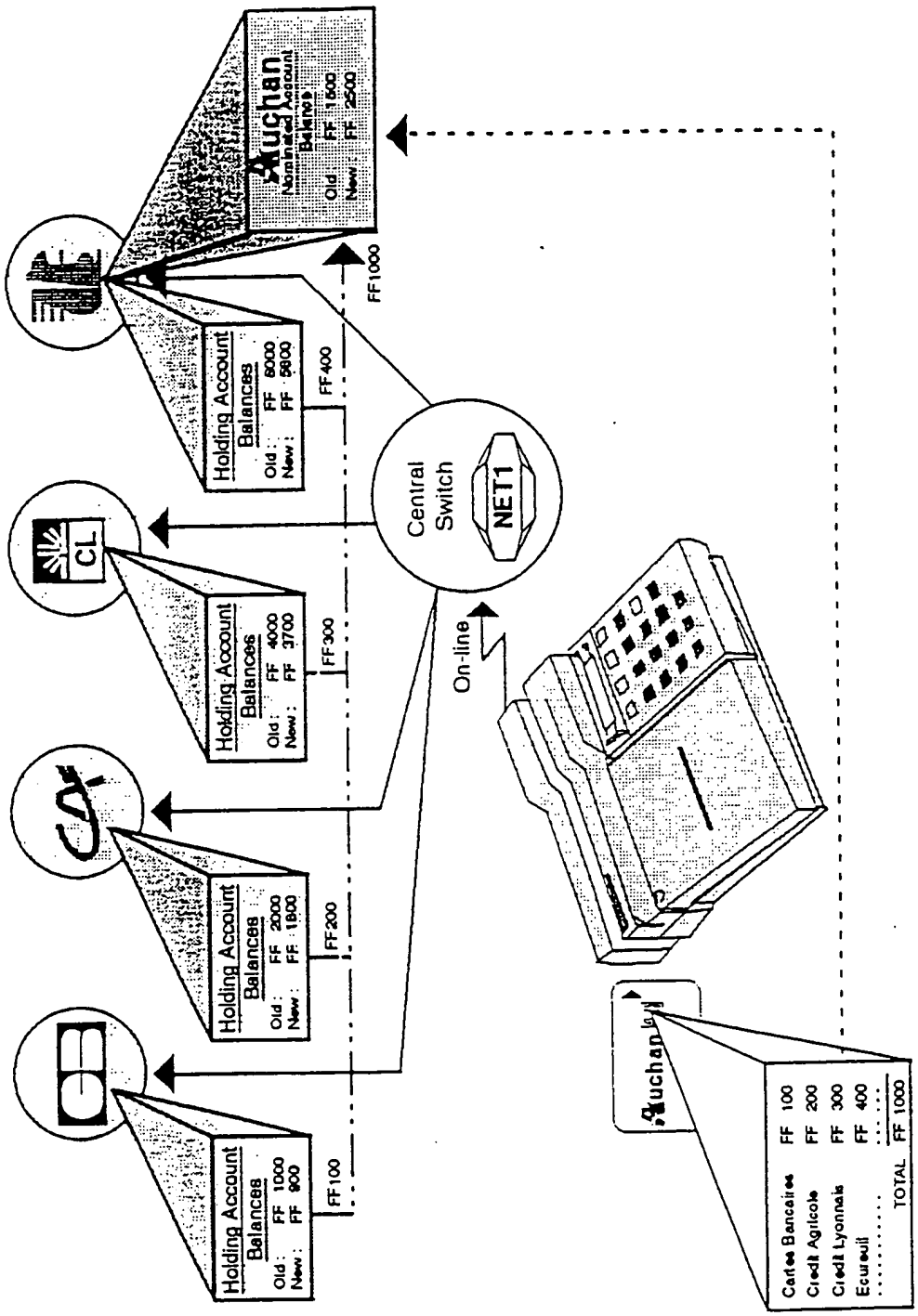

Auchan
Nominated Account
Balance
Old : FF 1500
New : FF 2500
FF1000
Holding Account
Balances
Old : FF 8000
New : FF 5800
FF400
Holding Account
Balances
Old : FF 4000
New : FF 3700
FF300
Holding Account
Balances
Old : FF 2000
New : FF 1800
FF200
Holding Account
Balances
Old : FF 1000
New : FF 800
FF100
Central Switch
NET1
On-line
Auchan
Cartes Bancaires FF 100
Credit Agricole FF 200
Credit Lyonnais FF 300
Ecureuil FF 400
TOTAL FF 1000

FIG 7

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